LIBBY DATA UPDATE
1/30/2008

1.0 BACKGROUND

Current plan for risk assessment for exposure to LA in outdoor soil:

For any specified exposure area:

1. Characterize soil in exposure area by PLM-VE and/or Visible inspection
2. Use empiric ABS data to estimate C(air) for that soil category and any one or combination of soil disturbance activities
3. Compute cancer and non-cancer risk using one or more alternative risk models, taking scenario-specific exposure time, frequency and duration into account

2.0 WHAT'S THE PROBLEM?

S-QAPP data for outdoor ABS showed trend (see Fig 1)
These data were judged to be too limited, so more ABS data were collected. New data support trend, but have much higher ABS values for clean soil and Bin A soil than before (see Fig 2).

QUESTIONS:

- Why are ABS air values so high for clean fill and Bin A soil?
- What is the source of the fibers seen?
- What are the current estimates of risk for clean soil and Bin A soil?

3.0 NEW INFORMATION

[Note-some of the following has not been validated and is subject to correction. Also, some data continue to come in. Thus, all information is "As of now" and may change]

3.1 Why are ABS air values so high for clean fill and Bin A soil?

a) Stratification of Bin A according to Vis score yields dramatic results (see Fig 3). Bin A V- is pretty much the same as clean fill, and Bin A V+ seems to be clearly higher.

b) Not all clean fills are equal (see Fig 4). ABS air data for 5/6 ABS measurements using clean fill from Eureka suggest levels are much lower than for clean fill from Libby. There is one exception that may or may not have an explanation as an unreliable data point.

c) Detailed review of the data indicate some of the high values for clean fill and Bin A V- soils may be misleading because the soil categorization may be incorrect and/or there might be other sources contributing (see Fig 5, Table 1). There are a few that might be

biased low, too. If any of these high data points are ranked as unreliable or unrepresentative, concentration values might come down some for these bins.

3.2 What is the nature of the fibers seen in clean fill?

Data on the fraction of total LA fibers that are NaK in various media are summarized in Table 2. As seen:

- fibers from the mine area are highly enriched in NaK
- fibers in air and soil in Libby are mainly NaK, but there are some non-NaK present. The fraction that is NaK increases when contamination levels increase
- data from other locations (Eureka, Helena) are limited, but suggest that most fibers ranked as LA are not NaK.

4.0 ESTIMATED RISK LEVELS

Risks were calculated based on the following assumptions

ET = 2 hrs/day
EF = 20 days/yr
Age at start = 0
Age at end = 30

Risk based fractions are based on the most current EX ABS data.
Results are shown in Table 3. Note that RBF(PCME) and the RBF(Berman-Crump) both seem somewhat lower based on new ABS data that based on previous data.

Risk results based on these exposure assumptions and RBFs are presented in Table 4.

4.0 CONCLUSIONS

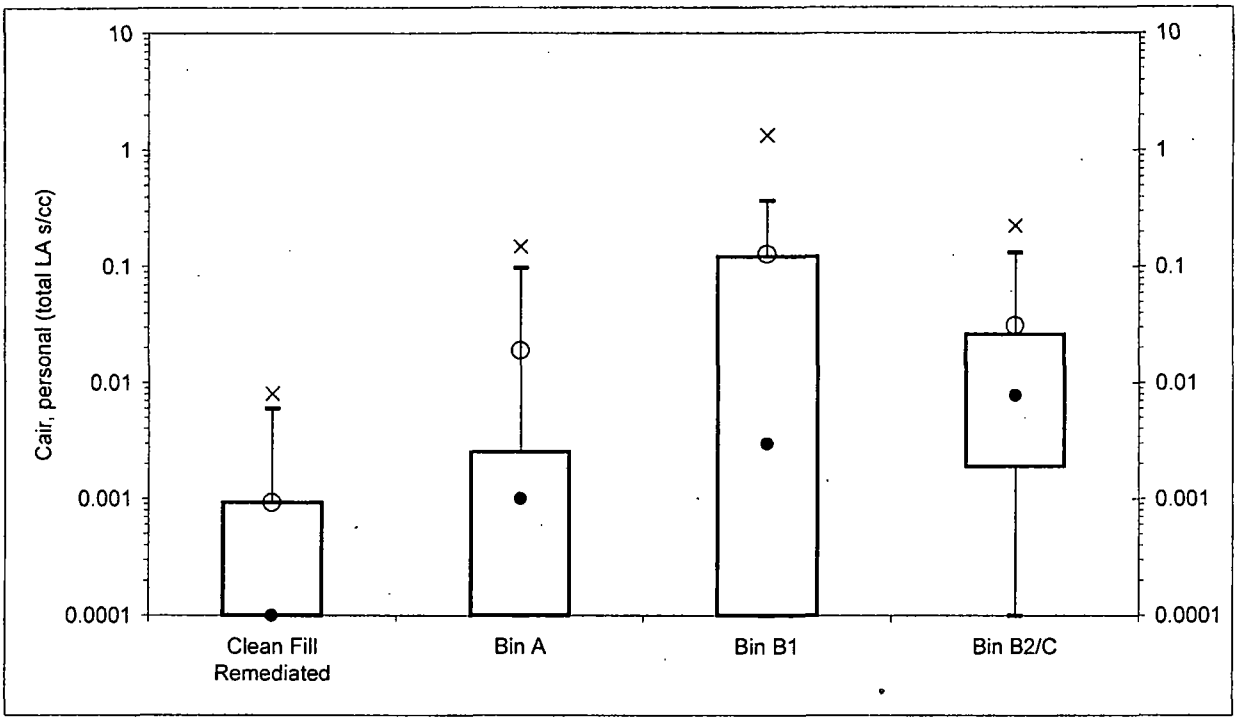
- "Background" soils in Libby (clean fill from Libby, Bin A Vis-) contain LA fibers, mainly NaK (70-80%), and ABS at these locations does release LA to air. Clean fill from Eureka seems to have lower levels, but data are too limited (and internally inconsistent) to make strong statements.

- When levels of LA in soil become detectable by PLM-VE and/or by visible vermiculite inspection, concentrations in ABS air increase. .

- Dose-response (ABS air vs soil level) is not ideal. Why is Bin A Vis + higher than Bin B1?

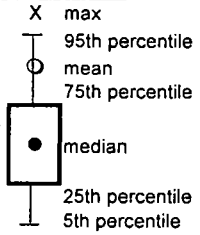
All results are draft and are subject to revision

FIGURE 1. SQAPP OUTDOOR ABS DATA



Non-detects are displayed at 0.0001 s/cc.

Box and whisker legend:



	Clean Fill (Remed)	Bin A	Bin B1	Bin B2/C
N samples	23	10	22	12
max	0.0081	0.15	1.3	0.23
mean	0.00092	0.019	0.13	0.031
95th percentile	0.0060	0.097	0.37	0.13
75th percentile	0.00093	0.0025	0.12	0.026
50th percentile	0	0.0010	0.0030	0.0077
25th percentile	0	0	0	0.0019
5th percentile	0	0	0	0

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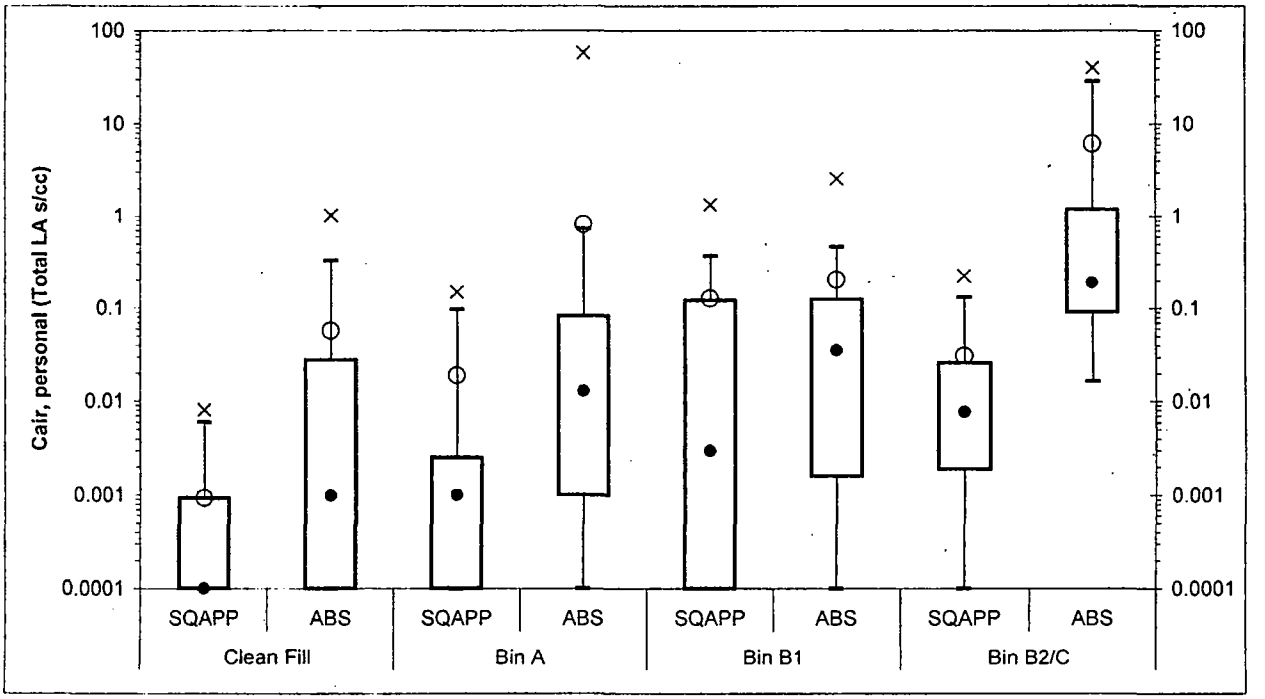
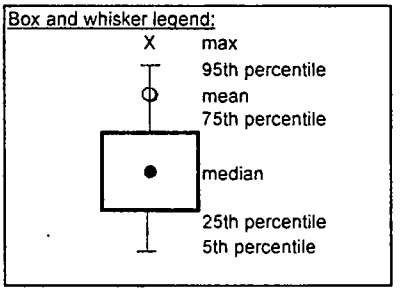
FIGURE 2. COMPARISON OF SQAPP AND ROUND 1 EXTERIOR ABS DATA



Non-detects are displayed at 0.0001 s/cc.



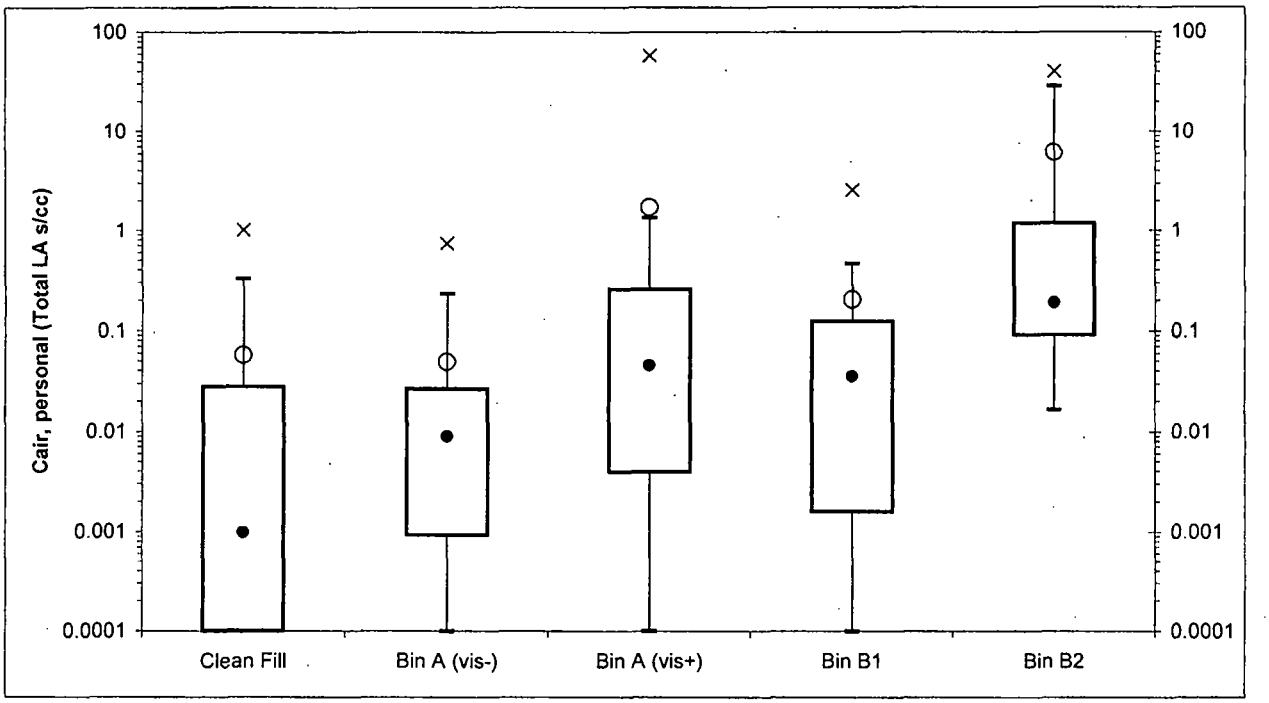
Data are based on a download performed 1/16/08.

ABS	Clean Fill (Remed)	Bin A	Bin B1	Bin B2/C
N samples	45	83	20	7
max	1.0	58	2.6	40
mean	0.057	0.82	0.20	6.1
95th percentile	0.33	0.74	0.47	29
75th percentile	0.028	0.083	0.13	1.2
50th percentile	0.0010	0.013	0.036	0.19
25th percentile	0	0	0.0016	0.091
5th percentile	0	0	0	0.017

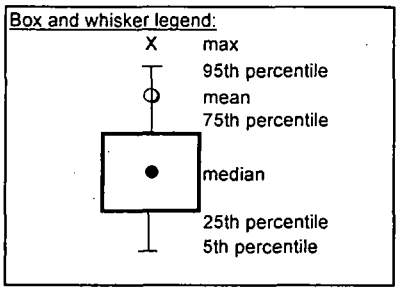
SQAPP	Clean Fill (Remed)	Bin A	Bin B1	Bin B2/C
N samples	23	10	22	12
max	0.0081	0.15	1.3	0.23
mean	0.00092	0.019	0.13	0.031
95th percentile	0.0060	0.10	0.37	0.13
75th percentile	0.00093	0.0025	0.123	0.026
50th percentile	0	0.0010	0.0030	0.0077
25th percentile	0	0	0	0.0019
5th percentile	0	0	0	0

All results are draft and are subject to revision

FIGURE 3. ROUND 1 EXTERIOR ABS DATA AFTER STRATIFICATION OF BIN A SOILS



Non-detects are displayed at 0.0001 s/cc.

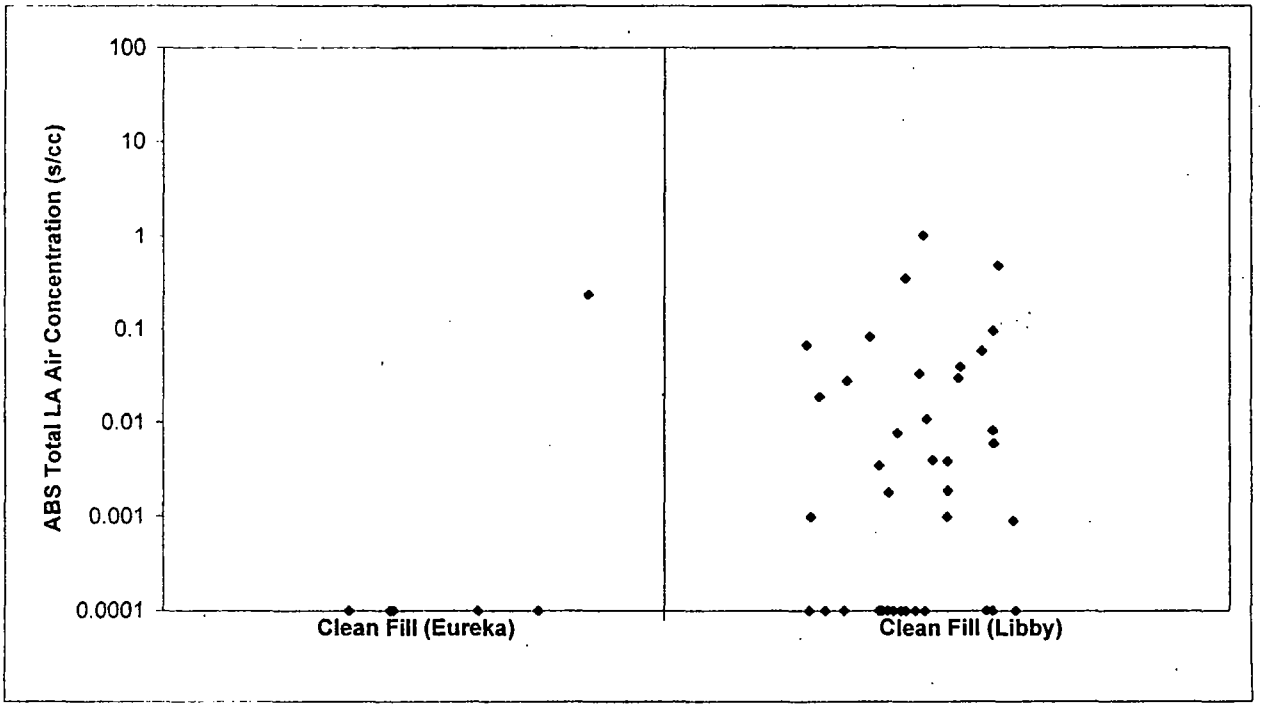


	Clean Fill (Remed)	Bin A (vis-)	Bin A (vis+)	Bin B1	Bin B2
N samples	45	45	38	20	7
N Locations	15	17	14	9	4
max	1.0	0.74	58	2.6	40
mean	0.057	0.049	1.7	0.20	6.1
95th percentile	0.33	0.23	1.4	0.47	29
75th percentile	0.028	0.027	0.26	0.13	1.2
50th percentile	0.0010	0.0090	0.046	0.036	0.19
25th percentile	0	0	0.0039	0.0016	0.091
5th percentile	0	0	0	0	0.017

Data are based on a download performed 1/16/08.

All results are draft and are subject to revision

FIGURE 4. TOTAL LA LEVELS IN PERSONAL AIR SAMPLES FROM CLEAN FILL LOCATIONS ACROSS ALL OUTDOOR ABS SAMPLES (ROUND 1)



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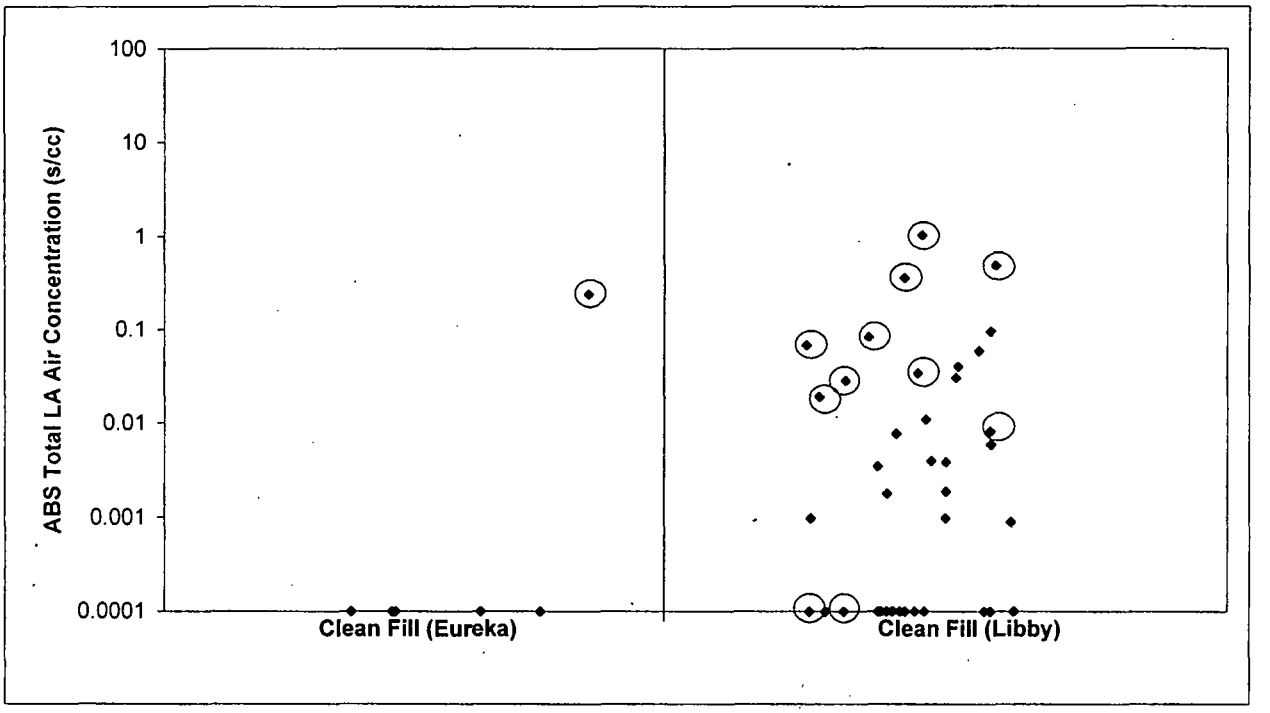
All results are draft and are subject to revision

FIGURE 5. TOTAL LA LEVELS IN PERSONAL AIR SAMPLES FROM CLEAN FILL LOCATIONS ACROSS ALL OUTDOOR ABS SAMPLES (ROUND 1)



○ = potentially suspect data

Non-detects are displayed at 0.0001 s/cc.

Data are based on a download performed 1/16/08.

TABLE 1. DETAILED INFORMATION ON CLEAN FILL (EXT1) PROPERTIES SAMPLED DURING EXTERIOR ABS SCENARIOS

Address	EXT Desc	Exterior Removal Dates	Clean Fill Source	Soil Contamination Remaining?	EX ABS Soil Results			Raking		Playing		Mowing		N LA Struc.	% NaK	SRC Notes
					PLM-VE MF (%)	V+/-	Visible Score	Index ID	Total LA Cair (s/cc)	Index ID	Total LA Cair (s/cc)	Index ID	Total LA Cair (s/cc)			
292 Spencer Rd	Ext1	10/8/04-10/13/04	Eureka	yes [1]	ND	V-	0	EX-00121	0	EX-00129	0	EX-00131	0	0	--	VV (low) noted for NSUA zones but NSUA sample indicates 30X
304 Spencer Rd	Ext1	10/4/04-10/9/04	Eureka	yes [2]	ND	V-	0	EX-00165	0	EX-00170	0	EX-00174	0.2340	8	100%	neighbor was mowing lawn during mowing ABS; nearby removal noted
1314 Dakota Ave	Ext1	6/27/05-6/29/05	Libby, Rusinski	no	ND	V-	0	EX-00320	0	EX-00365	0	EX-00369	0	0	--	neighbor was weed-whacking during child playing ABS
546 Granite Ave	Ext1	9/21/05-9/26/05	Libby, Rusinski	yes [3]	ND	V-	0	EX-00666	0.0010	EX-00669	0.0110	EX-00671	0.0038	14	100%	EXT3 (PLM ND, VV+) also performed at this property
813 Wisconsin Ave	Ext1	7/13/05-7/19/05	Libby, Rusinski	yes [4]	ND	V-	0	EX-00289	0.0019	EX-00292	0.0010	EX-00294	0	3	100%	
10 Park St	Ext1	9/29/06-10/6/06	Libby, Fink	no	ND	V-	0	EX-00602	0.0077	EX-00605	0.0397	EX-00607	0.0301	17	35%	
1414 Main Ave	Ext1	7/14/06-7/20/06	Libby, Fink	no	ND	V-	0	EX-00147	0	EX-00152	0.0589	EX-00156	0.0009	6	17%	
21 Voves Ave	Ext1	6/8/06-6/15/06	Libby, Fink	yes [5]	ND	V-	0	EX-00066	0	EX-00067	0	EX-00070	0	0	--	nearby removal noted
280 S. Central Rd	Ext1	6/17/03-6/28/03	Libby, Feller	yes [6]	ND	V-	0	EX-00358	0.0190	EX-00443	1.0172	EX-00445	0.3514	112	91%	VV (low) noted in both play areas > 3"
106 Voves Ave	Ext1	7/10/03-7/21/03	Libby, Feller	yes [7]	ND	V+	2	EX-00690	0.0829	EX-00693	0.0336	EX-00695	0.0674	60	82%	
1302 Airth Ave	Ext1	9/3/03-9/12/03	Libby, Feller	yes [8]	ND	V-	0	EX-00210	0	EX-00215	0	EX-00095	0	0	--	
2293 Kootenai River Rd	Ext1	6/12/03-7/15/03	Libby, Feller	no	ND	V-	0	EX-00312	0	EX-00315	0	EX-00317	0.0018	1	100%	wet soil is noted during child playing ABS
281 S. Central Rd	Ext1	8/12/03-8/13/03	Libby, Feller	no	ND	V-	0	EX-00499	0.0280	EX-00541	0.0082	EX-00543	0.4747	23	22%	VV (low) noted in 2 of 3 play areas
3798 Highway 2 S	Ext1	9/16/03-9/26/03	Libby, Feller	yes [9]	ND	V-	0	EX-00297	0	EX-00305	0	EX-00307	0.0035	1	0%	smoke from nearby forest fire is noted
156 S. Central Rd	Ext1	8/7/02-8/14/02	Libby, Boothman	no	ND	V-	0	EX-00506	0.0040	EX-00509	0.0958	EX-00510	0.0059	18	78%	smoke from nearby forest fire is noted

[1] Back yard Area F subsection 2 was <1%
[2] Front yard and southeast portions of back yard (Areas A & B) were <1%
[3] Multiple Areas in yard and flowerbed were <1% at 6-18" below ground surface (bgs)
[4] Yard Areas B, C, E, G were <1%
[5] Front yard (Area A) and back yard (south half of Area G) were <1% at 12-14" bgs
[6] Bottom of most of excavation, perimeter of excavation - in & on the side of the road
[7] Under pumphouse & under walkway at 10-12" bgs
[8] Yard and flowerbed were <1%
[9] Small amounts contamination remain at bottom of yard excavation between house & trailer

Based on Libby2DB Download: 1/25/08

TABLE 2 LA COMPOSITION DATA

Location	Medium	Sub-type	Count of LA Structures		
			Total	NaK	%NaK
Mine	Ore	USGS data (Meeker et al)	Lots	Few	>95%
	Air	USGS personal air (a)	Lots	Few	>95%
Libby	Air	Ambient	92	53	58%
		EX ABS CF	263	203	77%
		EX ABS A-	423	349	83%
		EX ABS-A+	996	874	88%
		EX ABS ≥ B	1136	1046	92%
	Soil	SEM of PLM-VE A (USGS)	111	86	77%
		TEM of PLM-VE A (Hygeia)	157	110	70%
Helena	Air	Ambient	18	1	6%
Eureka	Air	Ambient	1	0	0%
		EX ABS CF	8	8 [??]	0-100% [??]
	Soil	EX ABS CF	No data		

(a) Verbal report from lab...data not yet received

TABLE 3. RISK-BASED FRACTIONS

VALUES BASED ON EXTERIOR ABS ROUND 1

Soil Category	N Total LA Structures	$PCME_{LA}$ Structures		$BCPS_{LA}$ Structures	
Libby Clean Fill	255	77	30%	4	1.6%
ND (V-)	423	119	28%	12	2.8%
ND (V+)	996	315	32%	20	2.0%
B1	652	303	46%	19	2.9%
B2	429	115	27%	8	1.9%
Total	2755	929	34%	63	2.3%

Clean Fill Source	N Total LA Structures	$PCME_{LA}$ Structures		$BCPS_{LA}$ Structures	
Eureka	8	6	75%	1	12.5%
Libby, Boothman	18	8	44%	1	5.6%
Libby, Feller	197	56	28%	3	1.5%
Libby, Fink	23	8	35%	0	0.0%
Libby, Rusinski	17	5	29%	0	0.0%
Total	263	83	32%	5	1.9%

OLDER vs NEWER DATA

Data Set	N Total LA Structures	$PCME_{LA}$		$BCPS_{LA}$	
		N Structures	Risk-Based Fraction	N Structures	Risk-Based Fraction
Historic† Air	18,301	8,246	45.1%	724	4.0%
Current* Air	24,419	11,058	45.3%	948	3.9%
Previous‡ Outdoor ABS Air	1,167	492	42.2%	54	4.6%
Current** Outdoor ABS Air	2,755	929	33.7%	63	2.3%

PCME: L > 5 um, W ≥ 0.25 um, AR ≥ 3:1

BCPS: L > 10 um, W ≥ 0.4 um

† Based on data downloaded on 8/31/06
* Based on data downloaded on 1/25/08
‡ Based on Phase 2 rototilling and SQAPP Task 3 mowing/raking/playing
** Based on Outdoor ABS (EX) mowing/raking/playing

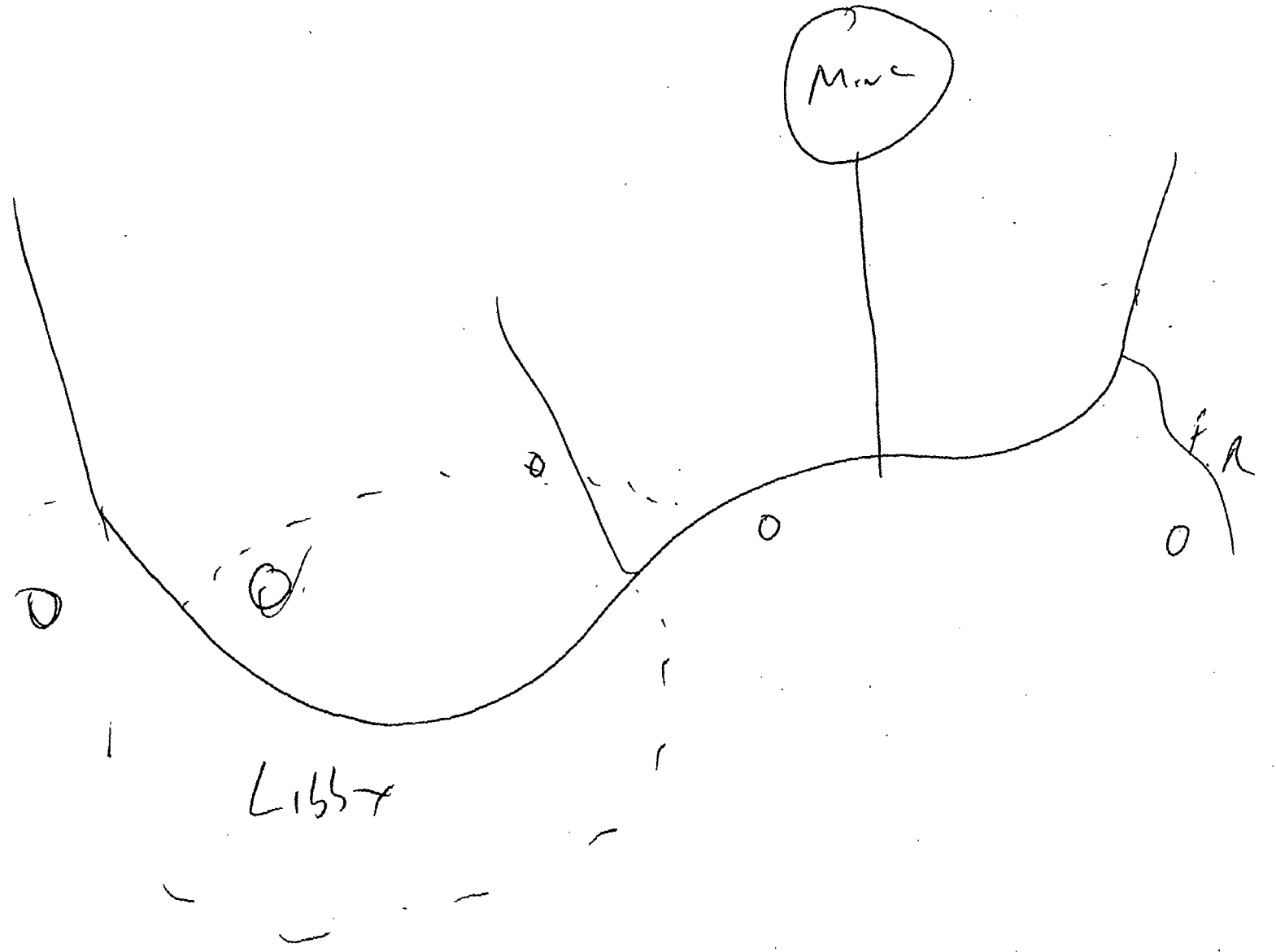
Libby2DB Download Date: 1/25/008

TABLE 4 PRELIMINARY CANCER RISK ESTIMATES

Soil Category	Conc. (Total LA f/cc)	Cancer Risk Model				
		IRIS	IRIS'	BC	Site-Specific	Other Sites
Clean Fill	0.058	1.5E-05	2.3E-05	3.3E-05	5.1E-05	1.0E-04
Bin A Vis-	0.049	1.3E-05	1.9E-05	2.8E-05	4.3E-05	8.5E-05
Bin A Vis+	1.7	4.5E-04	6.7E-04	9.6E-04	1.5E-03	3.0E-03
Bin B1	0.20	5.3E-05	7.9E-05	1.1E-04	1.7E-04	3.5E-04
Bin B2	6.1	1.6E-03	2.4E-03	3.4E-03	5.3E-03	1.1E-02

Exposure Assumptions:

RBF(PCME)	0.34	PCME fibers/ total LA fibers
RBF(BC)	0.023	BC protocol fibers/ total LA fibers
ET	2	hrs/day
EF	20	days/yr
Age at start	0	yrs
Age at end	30	yrs


Mine
Light